

## Research Application Summary

### Shelf life of whole Lake Malawi Tilapia (*Chambo*) stored in ice

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#### Abstract

This study was conducted to determine time when freshly caught Lake Malawi tilapia (*Chambo*) can remain in acceptable and safe condition for consumers. Sensory, microbiological, and proximate composition analyses including measurement of pH were conducted on fresh fish samples collected from Lake Malawi and stored in ice. The versatile quality index method (QIM) scheme was employed to determine the shelf life of the fish by combining findings from all the analyses. Results demonstrated that with good storage in ice, *Chambo* can remain in acceptable and safe condition for consumers for up to 16 days.

Key words: *Chambo*, Lake Malawi, microbiological

#### Résumé

Cette étude a été menée pour déterminer le temps où le tilapia (*Chambo*) du lac Malawi fraîchement pêché peut rester dans un état acceptable et sans danger pour les consommateurs. Les analyses de la composition sensorielle, microbiologique, et immédiate, y compris la mesure du pH, ont été effectuées sur des échantillons de poisson frais prélevés dans le lac Malawi et conservés dans la glace. Le plan de la méthode de l'indice de qualité versatile (MIQ) a été employé pour déterminer la durée de conservation du poisson en combinant les résultats de toutes les analyses. Les résultats ont démontré que, avec une bonne conservation dans la glace, *Chambo* peut rester dans un état acceptable et sans danger pour les consommateurs pour un maximum de 16 jours.

Mots clés: *Chambo*, Lac Malawi, microbiologique

#### Background

Tilapia (locally known as *Chambo*) is an important commercial fish, widely accepted and consumed by nearly all Malawians. It is also an important export commodity. *Chambo* is caught fresh from Lake Malawi and transported to distant major inland selling points preserved in ice. Fish being highly perishable, there is need to have a good criteria for monitoring quality and

freshness in order to maintain a high acceptability state for human consumption. As it is the case with other stored and consumed products, it is also important that consumers have knowledge of how long (shelf life) fresh *Chambo* can remain acceptable and safe for consumption while kept in ice. While it is common and sometimes mandatory in other countries especially the EU to have determined shelf life of different fish species, in Malawi this is not the case. This poses a great health risk to consumers. It is on this background that studies aimed at determining shelf life of *Chambo* stored in ice was based. The aim of the study is to help fish quality inspectors, processors and consumers to easily determine quality and freshness of fresh *Chambo* in the market.

### Literature Summary

Due to its biological composition, fresh fish deteriorates rapidly if not preserved at low temperature immediately after capture (Ashie *et al.*, 2009). Fish spoilage therefore begins as soon as it is dead because lack of energy stops their normal defense mechanisms resulting into initiation of a series of complex chemical changes that begin to cause spoilage – a phenomenon known as *rigor mortis*. Rigor mortis - a process not yet fully understood and simply referred to as *rigor* is defined as loss of flexibility in fish due to stiffening of muscles a few hours after its death (Adebowale *et al.*, 2008). In high ambient tropical temperatures like that of Malawi, several workers (Boland *et al.*, 2004) have concluded that fish becomes unfit for human consumption in less than 24 hours. According to some workers, wholesome freshness can only be guaranteed in live fish hence the indispensable need for quality assurance in fresh fish and fish products (Alasalvar *et al.*, 2011). Initial loss of freshness in fresh fish has been attributed to the activity of endogenously autolytic enzymes in the muscles while rapid proliferation of specific spoilage organisms (SSO) causes subsequent spoilage (Huss, 1995). In general, microbial activity, autolytic enzymes and chemical reactions cause post-mortem changes in fresh fish (Ghaly *et al.*, 2010). These changes are useful indices for determining quality or spoilage of fish and fish products in food quality studies (Botta, 1995).

### Study Description

About 60 whole fresh *Chambo* fish samples were purchased from fish sellers early in the morning (4am - 5am) soon after landing their catch at the southeast arm of Lake Malawi in Mangochi district in March 2011. The fresh fish were immediately stored in ice in cool boxes and then transported to the laboratory for sample analysis. Freshness and quality of the

fish stored in ice were evaluated using sensory evaluation by applying the quality index method (QIM) scheme (Martinsdóttir *et al.*, 2001). Sensory evaluation findings were then validated with microbiological (total counts of spoilage and pathogenic bacteria), pH and proximate composition analysis of the same fish samples.

### Research Application

Results suggest that freshly caught *Chambo* fish stored in ice can remain in consumer acceptable conditions for a period of over 16 days but not exceeding 18 days (Fig. 1). These results agree with several workers that shelf life of Tilapia and other tropical fish tends to be higher than that of fish from temperate areas. Several studies document shelf life of tilapia between 14 and 18 days. Commonest isolated bacteria were *Micrococcus* and *Pseudomonads* species (Fig. 2) and bacteria population started to increase sharply after 15 days of storage in ice (Fig. 3).

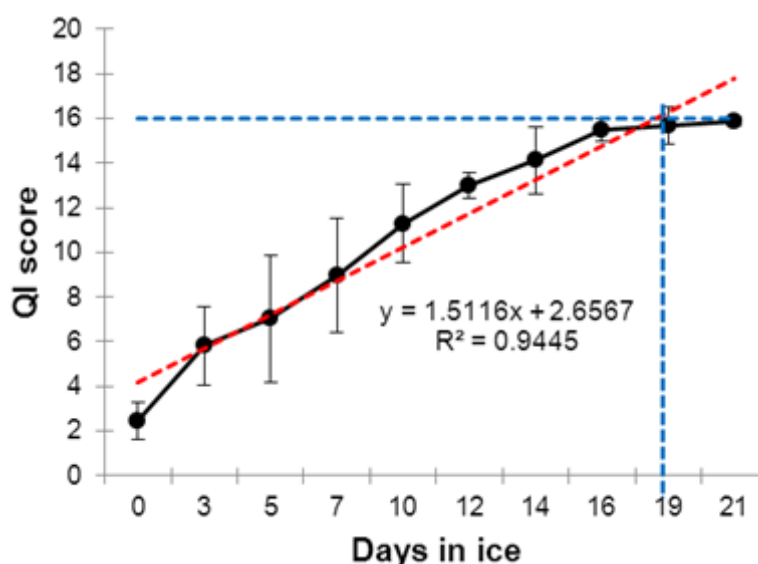


Figure 1. Quality Index (QI) of Lake Malawi tilapia (*Chambo*) stored in ice for 21 days.

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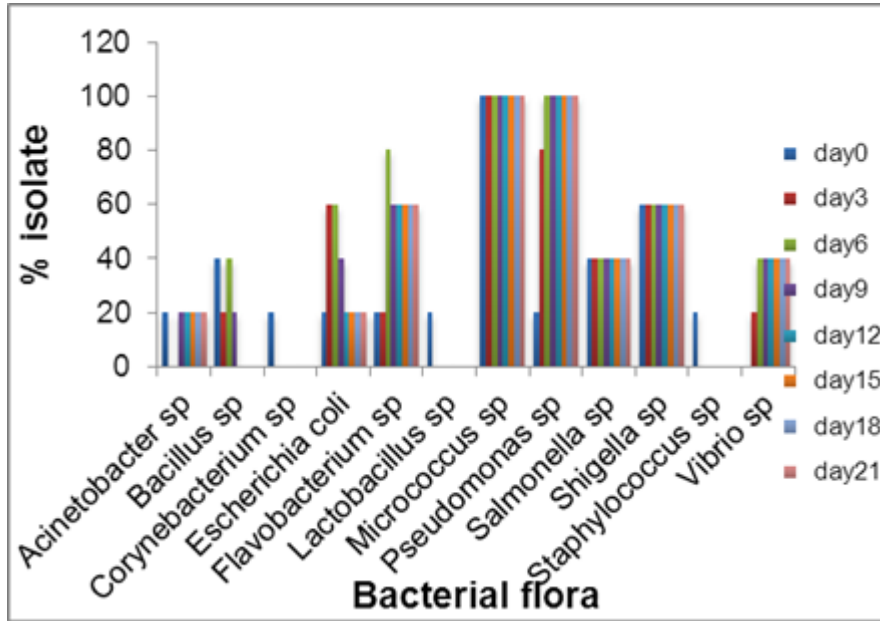


Figure 2. Changes in bacterial flora (%) of fresh Lake Malawi tilapia (*Chambo*) during storage in ice.

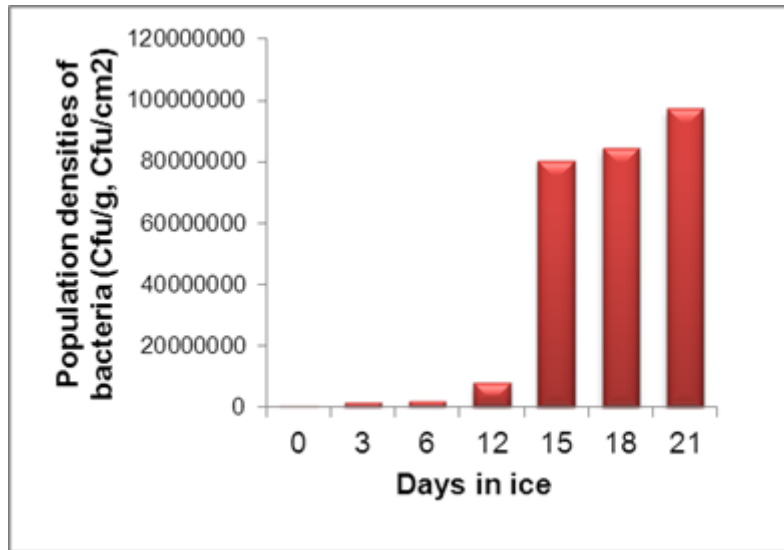


Figure 3. Mean population densities of bacteria isolated from whole fresh Lake Malawi tilapia (*Chambo*) fish samples during storage in ice for 21 days.

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